

# PDOK Kaart, the Dutch Mapping API

Haico van der Vegt\*, Leo van der Sluijs\*

\* Cadastre, Land Registry and Mapping Agency of the Netherlands

**Abstract.** PDOK (public services on the map) is a partnership of a number of Dutch government organisations, working together to build a central repository of reliable, accessible and efficiently managed location based information of the government. With INSPIRE being one of the biggest drivers behind this program, the aim has been to ‘invent the infrastructure wheel’ only once and use the solution many times, serving INSPIRE and other data to society, sharing common space.

Being an important part of the National Spatial Data Infrastructure, web-services are made available, showing and providing nationwide topographic and thematic maps of all kind, from INSPIRE to Key Registers. The underlying data are nearly all open data and therefore free of charge, as well as the webservices. It has a service oriented architecture, complying with the INSPIRE implementing rules and the Dutch interoperability framework, guaranteeing a high availability service level and user support. As a single point of access for governmental geodata, it can be considered as a fundamental building block for creating added value services and applications for society.

In the PDOK web portal, all the available PDOK data and services can be searched, viewed and downloaded. It gives you important documentation about the services, as well as examples of how these services can be integrated in real world applications. Besides serving the national (also INSPIRE) geographic metadata register and an ArcGIS extension to easily find and use the available data and services, one of the most eye-catching functionalities offered by this portal, is the mapping API (application programming interface), the so-called “PDOK Kaart”. It is a simple tool to integrate your own map in your website or web application. It gives you the ability to add cartographic symbols and markers and combine it with other cartographic map layers. Using the underlying webservices of PDOK, this mapping API is a free, for anyone to use tool. PDOK kaart is also free of advertisements, making it a valuable mapping tool within the government.

This paper describes the main features of the web facility PDOK in general and the cartographic possibilities of PDOK Kaart in detail, unlocking geographic information of the government for both public and private users.

**Keywords:** NSDI, mapping, API, geographic information, webservices

## 1 Context

The fast and online availability of reliable, high quality geographic information is essential in our information society. This is especially true for government organisations at all levels, using location based information in their daily decision making processes. But also civilians demand fast and reliable delivery of geodata, not so much as direct users of this information, but more as a client of the numerous web applications, served by private companies, using geographic data as a reference for their information supply to society.

Building and maintaining infrastructures to supply this geographic information is a costly and time consuming activity. Even more, if every public organisation builds its own infrastructure solution, then a lot of additional costs are involved. That is why many national governments aim at developing and building a national spatial data infrastructure (NSDI) solution, trying to reduce the overall costs for the provision of geo-information.

## 2 PDOK

In 2008, a number of Dutch government organisations decided to work together to build PDOK, a public hub for the Dutch NSDI. PDOK – Public Services on the Map – is an initiative of 5 public organisations: the Dutch Ministry of Economic Affairs, the Dutch Ministry of Infrastructure and Environment, the National Road Authority, Geonovum (Dutch NSDI executive committee) and the Cadastre, working together to build a central repository of reliable, accessible and efficiently managed location based information of the government. With INSPIRE being one of the biggest drivers behind this program, the aim has been to ‘invent the infrastructure wheel’ only once and use the solution many times, serving INSPIRE and other data to society, sharing common space. The goal is to serve as the central hub for serving all geographic information of the government.

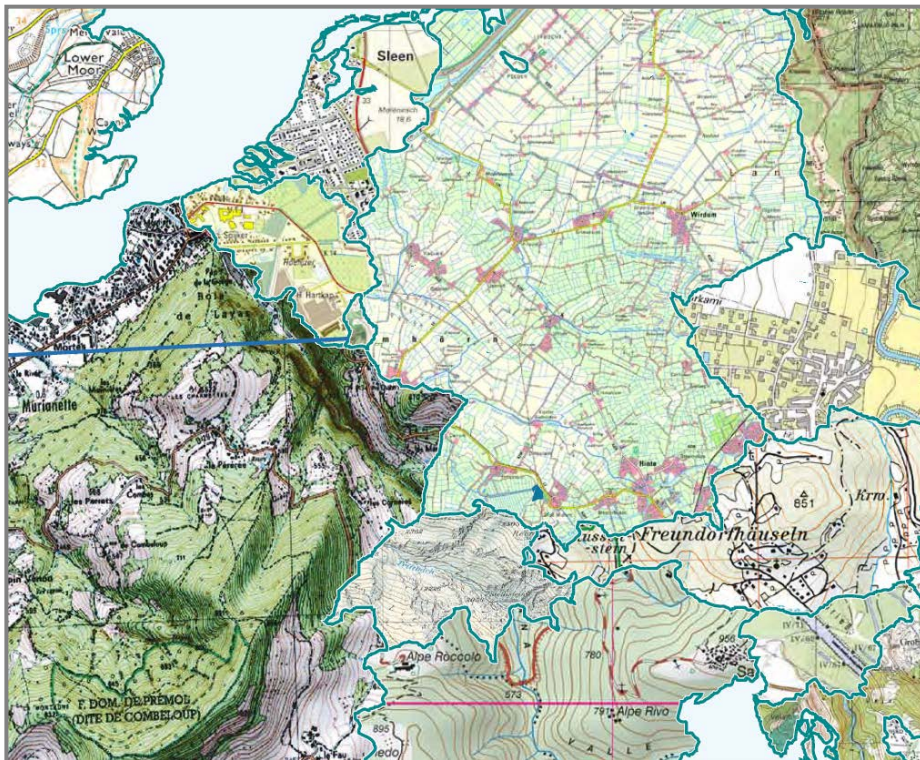
### 2.1 Main drivers

Being an important part of the National Spatial Data Infrastructure, web-services are made available, showing and providing nationwide topographic

and thematic maps of all kind, from INSPIRE to Key Registers. The underlying data are nearly all open data and therefore free of charge, as well as the webservice. Based on a service oriented architecture (SOA), PDOK complies with the INSPIRE implementing rules and the Dutch interoperability framework, guaranteeing a high availability service level and user support. As a single point of access for governmental geodata, it can be considered as a fundamental building block for creating added value services and applications for society.

### 2.1.1 INSPIRE

The European INSPIRE (Infrastructure for Spatial Information in Europe) directive is an important driver for developing these NSDIs at the national level. Its goal is to create a European wide SDI across the European Union, supporting the development of European and national environmental policies. Currently, geographic data from the EU member states vary in content, semantics and reference systems. *Figure 1* shows the differences in topographic maps at medium scale of a number of European countries.



**Figure 1.** Sample of national topographic maps in Europe

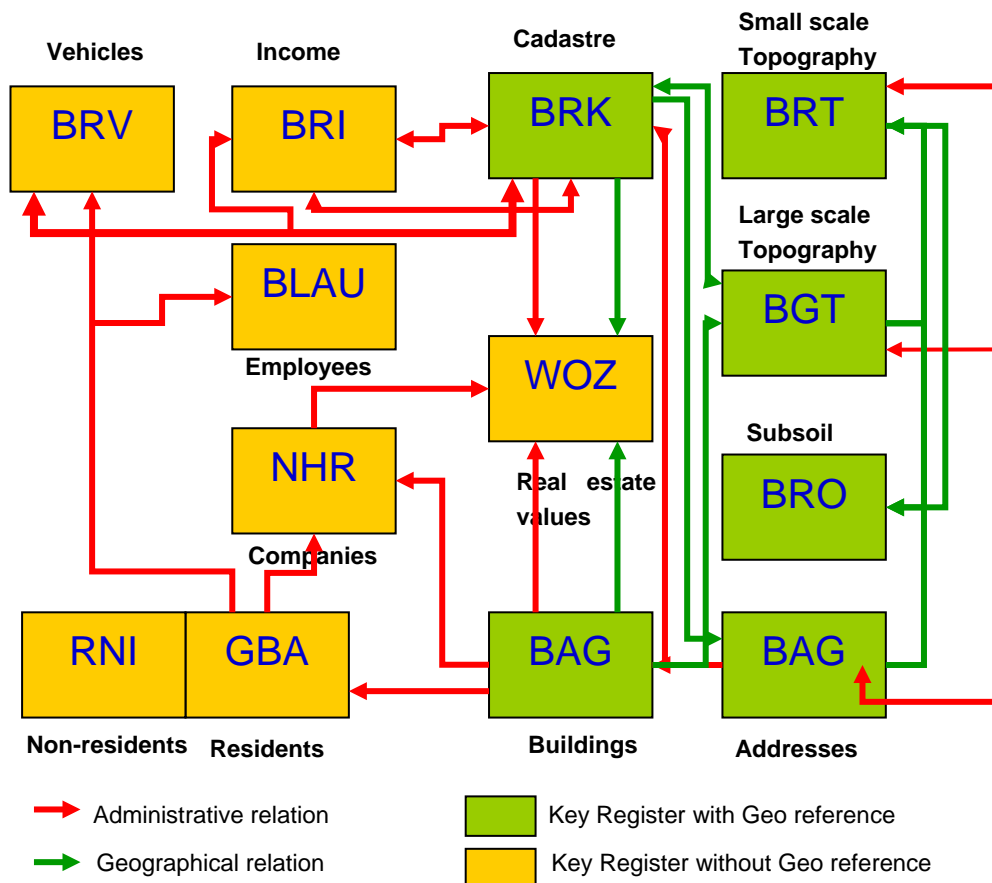
As environmental problems don't stop at the national borders, harmonisation of this spatial data is crucial in helping to solve these problems. INSPIRE defines standards to harmonise these spatial data, metadata, web-services and sharing conditions.

PDOK has been developed to assist its partners to fulfill their INSPIRE obligations by building a common platform to create, discover, provide and share Dutch INSPIRE data. But, as more and more Dutch public organisations face INSPIRE responsibilities, PDOK also offers this platform to support other governmental organisations to produce INSPIRE data and services.

#### 2.1.2 Key Registers

Until recently, the Dutch government stored its records about persons and their income, about roads, addresses and buildings at many different departments and in many systems. Apart from the problem of duplication, it also means all these data stores continuously have to be kept up-to-date. To address this situation, the Dutch government has agreed on a system of so-called Key Registers<sup>1</sup>. The collection and maintenance of every key record is the responsibility of only one government organisation and has to be re-used by all other government organisations. When your address changes, you only need to report this to your municipality, as the holder of the key register of addresses, instead of informing many other government organisations about your move.

PDOK builds on this system of Key Registers, creating a single point of entry and distribution of government information for its partners, instead of all partners creating their own solutions. The central PDOK portal can also be used to disseminate the contents of a Key Register to other government departments. In this way, PDOK is the hub for all Key Registers that have a geographic component, like the Key Registers of Topography, Addresses, Buildings, and Cadastre. One of the first Key Registers provided through PDOK is the "Basisregistratie Topografie" (BRT), in English the "Key Register Topography". This register forms the backbone of the all-purpose background map that is served from the shared mapping platform and is part of the PDOK Kaart API, discussed later in this article (Mac Gillavry, Brentjens, van der Vegt 2011).



**Figure 2.** System of Key Registers of the Netherlands

## 2.2 Benefits

Nowadays, public organisations face budget cuts in the creation and supply of their information. This is also true for organisations responsible for providing spatial data. That is why they are looking to reach efficiency in the provision of their information.

### 2.2.1 More efficiency

More efficiency and better service are key elements in setting up the PDOK program. Working together to develop a common platform to serve their data and products is essential in coping with these budget cuts.

PDOK conforms not only to the Dutch eGovernment standards and other national and international standards, but the technical and quality of service requirements of INSPIRE as well. This attracts other organisations to

fulfill their INSPIRE obligations, using the already developed PDOK facility.

#### 2.2.2 Less redundancy

Typically, in-house applications use webservices, viewers, etc. specifically designed for this application. This means these webservices and viewers need to be created but also maintained, using valuable time and money.

Internal research within the Dutch Cadastre revealed that more than 14 different viewers were developed in a relative short time frame, all for specific purposes and using different techniques and software. All these webviewers use bespoke webservices but also needed to be maintained, taking valuable time and money.

Using the PDOK platform services, common storage and other functionalities saves money and maintenance time, creating benefits for the PDOK partner and other public organisations, wishing to use PDOK.

#### 2.2.3 Open data

The Dutch national government is promoting to make spatial data available free of charge and without any usage restrictions. PDOK is the central hub for serving these open, geographic data. At the moment, 42 datasets are being served of which 40 are open data, a number that will grow over the coming years (van der Sluijs, 2013).

### 2.3 Service Oriented Architecture

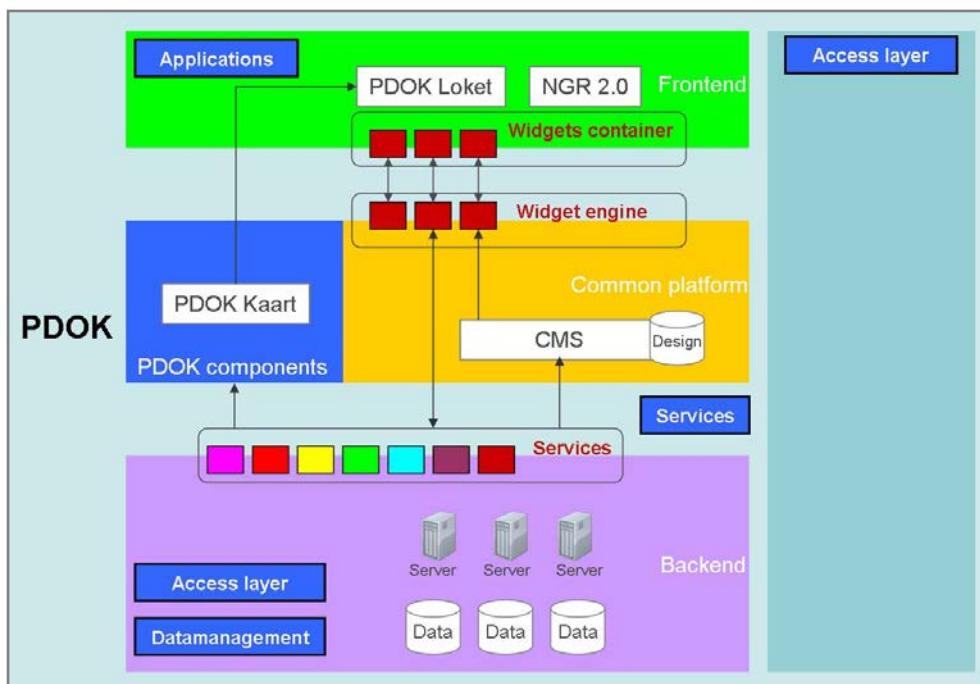
To be able to deliver the public spatial data and services, a service oriented architecture (SOA) has been developed for PDOK. This enables not only to deliver the actual datasets, but also the metadata and webservices, needed in the production processes of its users. To enable and improve the re-use of components and resource, standardization is very effective. In most cases, standards of the Open Geospatial Consortium (OGC) and ISO have been implemented (Maus, 2011).

The main components are:

- A metadata portal, [www.nationaalgeoregister.nl](http://www.nationaalgeoregister.nl), developed to search, find and deliver metadata about all available spatial datasets and services in the Netherlands. This portal also serves as the INSPIRE metadata catalogue and entry point.
- A central access layer to control the usage of the datasets and services.
- Webservices, complying with international standards of OGC and ISO, enabling interoperable use of the available information. Currently Web

Mapping Service (WMS), Web Feature Service (WFS) and Web Map Tile Service (WMTS) are available, while Web Coverage Service is being developed.

- A geocoding service, based on the Open Location Services Interface Standard of OGC.
- Techniques and tooling to extract, transform and load data in the PDOK environment.



**Figure 3.** PDOK Architecture

An important feature of PDOK is that almost all software is considered as open source software, making re-use of the developed code accessible to software developers, both for other public organisations and the private sector.

## 2.4 Service Levels

The PDOK platform is open to everyone who wishes to use the available products and services of PDOK. As mentioned before, only a few services are restricted and only accessible to specific users, due to privacy reasons or other restricted rights. E.g. high resolution ortho-imagery is only available to the partners who signed the contract.



PDOK has 3 different service level agreements (SLA). PDOK Basic – for the government; PDOK Education – for schools, universities, etc.; and PDOK Fair Use – for private companies and users.

	PDOK Basic		PDOK Education		PDOK Fair Use	
Access	Free	Secured	Free	Secured	Free	Secured
Support	Yes	No	Yes	No	Yes	No
Capacity	No limit	Restricted	No limit	Restricted	No limit	Restricted

**Figure 4.** PDOK service levels

With PDOK Basic, government organisations have a guaranteed service level, making spatial information from PDOK applicable in their daily production processes, as guaranteed availability is one of the key elements in these processes.

For educational organisations, PDOK Education offers more freedom to be able to experiment with the available products and services as this level has no usage limit. Daily support is not part of this service level.

Users not belonging to the 2 above mentioned groups can use PDOK according to the Fair Use level. The emphasis is on easy access to a wide audience of users. The service level and - capacity however is limited. It is meant to support small-scale usage of spatial information and to encourage innovation and product development. At this point in time, the private sector is only able to use PDOK according the Fair Use level agreement, although many wish to get access to PDOK Basic level.

## 2.5 Functionalities

In this section a number of functionalities of PDOK are highlighted. These applications are designed to make the usage of PDOK information more accessible and easier.

### 2.5.1 PDOK Locket

All PDOK products, services and other information are accessible through PDOK Locket, [www.pdok.nl/en/node](http://www.pdok.nl/en/node). In here, information about the different services and service levels can be found, are product catalogs available as well as the URL's of the services. Datasets can be downloaded, using Atom feeds or the download application of the Key Register Topography. A



forum has been developed to build up a community of PDOK users, with a FAQ section.

PDOK Loket also gives direct access to other applications, like PDOK Kaart, described in chapter 3.

#### 2.5.2 Nationaal GeoRegister, the national metadata portal

The Dutch metadata portal [www.nationaalgeoregister.nl](http://www.nationaalgeoregister.nl) is the location to search, find and use geo-information in the Netherlands. Through a search request, you get an overview of the available Dutch data sets and services. These data sets are in many cases directly downloadable; you can view the services or use them directly in your own application. The metadata portal can be accessed directly or from the PDOK Loket.

#### 2.5.3 PDOK viewer and background map

PDOK also serves a simple [viewer](#) where the available services can be showed. This demo viewer will soon be integrated in the PDOK infrastructure and serves a background map of the Netherlands, built from the Key Register Topography and other sources, like OpenStreetMap.

#### 2.5.4 ArcGIS plug-in

Another useful feature is the PDOK extension for ArcGIS users, developed by ESRI Netherlands. By installing this plug-in, ArcGIS users can search and sort information from the national metadata portal, the Nationaal GeoRegister, and directly view the available WMS, TMS and WFS web-services of PDOK. The extension is as an open source component available and can be downloaded from [www.esri.nl/pdok-extensie/](http://www.esri.nl/pdok-extensie/).

#### 2.5.5 PDOK Geocoder

To easily search for relevant datasets and services, users often reference their search by applying addresses, postal codes and names of cities and regions. The generic geocoding service available in PDOK uses the address information of the Key Register Addresses. This service can be used in the different applications of public organisations, guaranteeing the most up-to-date address information. The geocoding service conforms to the OpenLS interface specification of the OGC (Mac Gillavry, Brentjens T, van der Vegt H, 2011)

## 2.6 Facts and Figures

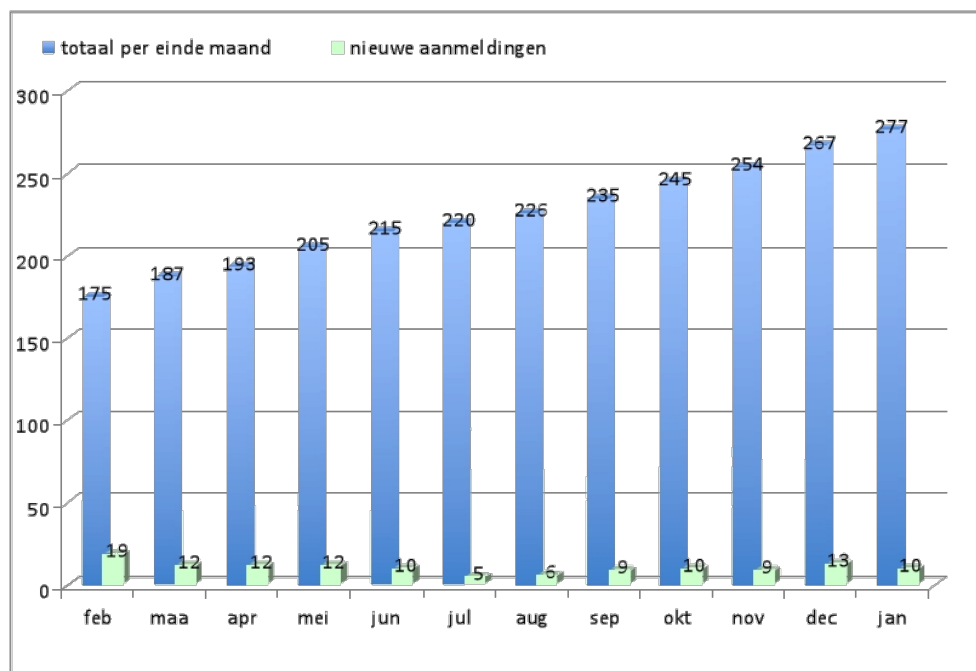
At the moment, a total of 42 datasets are served through PDOK. As said, 40 of these are open data and can be used free of charge and without any usage conditions by both public and private users.

### 2.6.1 Usage

These services generate an average of around 1 million map requests per month, of which 60% are produced by PDOK Fair Use users. These numbers are still growing, as more users access PDOK and more services are made available.

Looking at the number of connected users, a total of nearly 300 public organisations joined PDOK and use its products, services and functionalities. Every month, this total grows by about 10 new organisations.

The use of PDOK by the private sector is still under discussion. They can use PDOK according the Fair Use service level, but would like to have the PDOK Basic service level, guaranteeing its high availability and performance, making it a basic component in vital business processes.



**Figure 5.** Overview of new (green) and total (blue) users of PDOK Basic from February 2012 – January 2013

### 2.6.2 Finance

The PDOK program started as a project co-funded by the Dutch national government (50%). This program lasted 4 years until the end of 2012. From the beginning of 2013, the maintenance and further development of PDOK infrastructure is the responsibility of the Dutch Cadastre, while Geonovum has an important advisory role for PDOK.

At the moment, the 4 current partners of PDOK, mentioned above, pay an equal share of the maintenance costs of the PDOK infrastructure. The usage of PDOK by society, whether public or private, is free of charge.

If other public organisations would like to disclose their products and services using the PDOK platform, they are quoted a price. Depending on the complexity of the dataset, this can range from a fixed price for small and simple datasets, to a specific price for complex datasets.

### **3 PDOK Kaart**

As described above, PDOK gives its partners and users ample opportunities to disclose their products and services on the one hand, and use the available webservices on the other hand. But PDOK is more than an infrastructure, serving webservices. An important feature of PDOK is the possibility to create your own maps and integrate them in your own environment by using the PDOK Kaart API. The reasons and techniques behind this feature are described in the following sections.

#### **3.1 The Dutch mapping API**

Why develop a public mapping API while the private sector has already developed several alternatives (Google Maps, Bing Maps, etc.). These are accessible for free with high performance and availability. So why spend precious money and time developing this?

##### **3.1.1 Application Programming Interface**

Before detailing the reasons behind this public mapping platform PDOK Kaart, it is essential to know the general idea behind an API. A mapping platform is more than just an API and typically consists of several components to implement geographic web applications. The following components can be identified (Mac Gillavry E, Brentjens T, van der Vegt H, 2011):

- A number of maps, e.g. topographic or street maps and other background information like aerial or satellite imagery
- The mapping Application Programming Interface (API) itself, controlling the available data layers and other background information
- A gazetteer or geocoding service, matching address information to spatial locations
- Documentation to assist software developers to implement PDOK Kaart

- Technical support and Help Desk while using or integrating PDOK Kaart
- A development community, where developers can share their questions, observations and experiences regarding the further development of open source components
- If the usage of the available data sets and services cost money, an e-commerce system needs to be in place

### 3.1.2 Why a Dutch mapping solution?

The goal of a government organisation is to serve the common interest of the society. That differentiates it from commercial mapping solutions, serving its information applying commercial business models. The motivation for developing and building PDOK Kaart are (Mac Gillavry E, Brentjens T, van der Vegt H, 2011):

- Privacy: securing the personal interests of private users is essential as intelligent information systems can easily combine statistics coming from different online sources. For government bodies serving the public interest this more and more becomes an issue.
- No advertisements: government organisations are generally not allowed to use advertising in their online applications as opposed to the available commercial mapping APIs. PDOK Kaart is free of advertisements and can therefore be used by all public organisations.
- Service reliability: public and private organisations need a service level guarantee to be able to integrate the webservices in their daily business processes. PDOK Kaart can guarantee these service levels especially when public safety is in danger, whereas commercial mapping APIs do normally not guarantee this.
- Create once, use many: redundancy in bespoke viewers and webservices for internal production processes is a time and money consuming thing. By facilitating these services from a central source, efficiency can be reached by creating these services once and use it by multiple organisations in their many applications.
- Liability: using data from official and authentic public databases like Key Registers and other government datasets, PDOK Kaart ensures the usage of correct and high quality information, with known update cycles and sources of these datasets.

### 3.1.3 Usage conditions

Besides the legal and commercial aspects, there are also a number of issues dealing with the usability and quality of the offered maps (Mac Gillavry E, Brentjens T, van der Vegt H, 2011):

- **Accuracy:** correct information in terms of geometric and attribute accuracy is important for certain applications. Using official public sources, PDOK Kaart can ensure a high accuracy of its datasets and services
- **Accessibility:** since 2011, the official Dutch web accessibility guidelines, based on the Web Content Accessibility Guidelines 1.0 of the World Wide Web Consortium (W3C), are applicable to all government web applications and websites, certifying a high accessibility, usability and reliability for all its users

## 3.2 Creating your own map

Creating your own map using PDOK Kaart is a simple process. You can simply generate a static map, with or without extra thematic information (e.g. administrative boundaries) or symbols. It is also possible to integrate the map viewer in your own application or website, showing the available spatial data of PDOK in a flexible way. This means defining the needed spatial layers and incorporating this mapping API in your own environment. The [software code](#) of the PDOK Kaart API is available under the Creative Commons (CC-BY-3.0) license.

An example of a map created by PDOK Kaart is given below, involving the following steps (see <http://kaart.pdok.nl/help.html>):

### 3.2.1 Step 1

**Define the size of the map:** In step 1, you can define the size of your map. You can choose between the small formats (300 \* 250 pixels), medium (400 \* 350 pixels) and large (550 \* 440 pixels). The map is directly tailored to your choice.

Typically, the map shows the background (topographic) map or the orthoimagery of the Netherlands. If needed, PDOK Kaart gives you the interesting option to integrate other services available in PDOK in your map by choosing the webservice you want to appear in your map. It is also possible to add webservices coming from other platforms than PDOK. When your choice has been made, your map will show the added data layer(s) on top of the background map or orthophoto's.

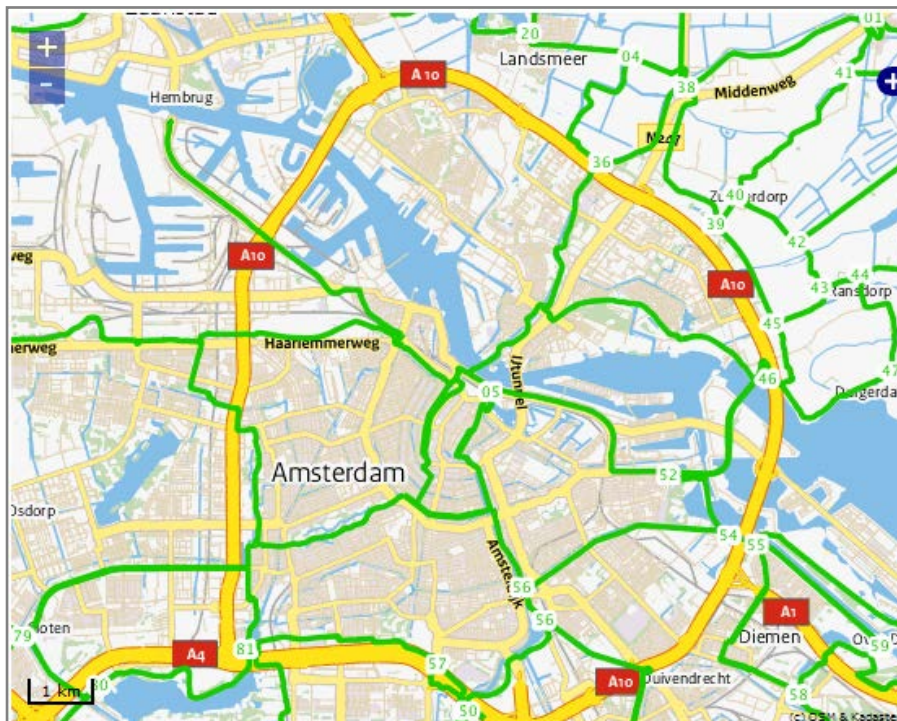
### 3.2.2 Step 2

In PDOK Kaart, you can add your own symbols, with descriptions of the meaning of the symbol. This symbol can be a point, line or polygon. When needed, you can change and/or delete this symbol. You can add as many markers as you like. They can be copied from another file as well.

### 3.2.3 Step 3

In this step you can generate the code to integrate your map in your own application. There a number of options, all giving the same result:

- URL link: the link generated by PDOK Kaart, can be copied directly in the navigation field of your browser. With this option, the map will be showed full screen.
- HTML iFrame or Object tag: copy the generated code in the html document of your choice. The size of your map depends on the size you have chosen in step 1.
- HTML and Javascript: for the more advanced users, the generated code can be copied into the head and body section of your HTML document. In this option, you can control the size in which you want your map to appear.



**Figure 6.** Map created in PDOK Kaart, showing cycling routes in green on top of the background map

## 4 Conclusions

PDOK is rapidly developing into the central hub for the provision of spatial data of government and other public organisations. Serving data and web-services according to well described service levels, the PDOK platform facilitates the usage of geographic information in the production processes of its partners and other public organisations.

Based on the INSPIRE requirements, PDOK conforms to the open standards of OGC and ISO, making its products and services as interoperable as possible. Other Dutch public organisations, responsible for providing INSPIRE data and services, are encouraged to join PDOK. On the one hand, to take advantage of the INSPIRE knowledge of PDOK to transform their source data into INSPIRE compliant information, on the other hand to use the already developed INSPIRE proof infrastructure of PDOK, serving their data and services according to the INSPIRE quality of service requirements.

This year, many new datasets and related webservices will be disclosed, making this platform even more attractive for other public partners to use this facility serving their own business processes. PDOK will also be extended with new functionalities, like clipping of datasets, authentication of users, monitoring and reporting tools, e-commerce facilities, change-only delivery and processing of data, etc. This will give PDOK partners and the public and private users even more flexibility to incorporate it in their own business environment.

PDOK Kaart presents the opportunity for public organisations as well as private users to build their own maps with a guaranteed quality, without any advertisements, with a guaranteed service level and respecting the privacy of its users. These maps can be created in an easy and straightforward way. If needed, even additional map layers can be included, making your map even more valuable to others. This way, PDOK Kaart serves as the Dutch public alternative for the current commercial mapping platforms.

## References

- Mac Gillavry E, Brentjens T, van der Vegt H (2011) Towards a Dutch Mapping API.
- Van der Sluijs L (2013) Actuele Geodata vanaf één plek



Maus J, Technical Design PDOK Motor Phase 1. Available at [http://www.geonovum.nl/sites/default/files/MOT\\_20100618\\_TechnicalDesign\\_v1.01.pdf](http://www.geonovum.nl/sites/default/files/MOT_20100618_TechnicalDesign_v1.01.pdf)